



Application No.: 09/618,741

Filing Date July 18, 2000

Group Art Unit: 1731

Attorney Docket No.: RTN2-118PUS

Claims 23 and 24 have been cancelled.

Claims 12 and 28 stand rejected over Maguire et al in view of Sepek and JP 403023269A.

Claim 12 is dependent on claim 11 which depends on claim 6. Claim 28 depend on claim 27 which depends on claim 25. In the last response, applicant pointed out the reasons why such claims 6 and 25 are patentable over Maguire et al.

As pointed out in such response, **in accordance with one embodiment of Applicant's invention**, the ALON powder is produced in a single heat treatment step using a continuous process. APPLICANT HAS DISCOVERED THAT BY PROVIDING A CHAMBER HAVING A TEMPERATURE GREATER THAN 1700 °C AND HAVING MIXTURE COMPRISING ALUMINUM OXIDE AND CARBON THE MIXTURE AGITATED IN THE CHAMBER A SINGLE HEAT TREATMENT STEP CAN PRODUCE ALON. Rather than use a two step process, Applicant describes a single step process. This is a key difference between the earlier art and the current application. It is the combination of the continuous processing, which provides for a uniform reaction environment for the powder precursors, and the reaction times for the chemical processes described, which allow this to occur. It is this combination which is unique. The single step reaction can take place in MINUTES, rather than HOURS as the earlier patents claim.

Furthermore, it is the combination of continuous processing and fast reaction times which allow the ALON powder to be produced at high rates at a low cost, required for commercialization of this material. The simple application of the earlier art requires two rotary calciners to be purchased (i.e., double the capital investment), and twice the processing time. These two factors would result in roughly doubling the cost of producing ALON powder. Based on the arguments presented, the subject invention represents a significant innovation, not a trivial extension of prior art.

NOTHING IN EITHER MAQUIRE OR SERPEK describes, suggests or recognizes that ALON can be produced by a single step process.

In accordance with another embodiment of the invention, the ALON is made in a semi-continuous or somewhat batch process with the chamber ramped to a temperature greater than or equal to 1700°C. As pointed out in the patent application: " ... at ramp rate of greater than 10-20

°C/min to a soak temperature of about 1700-1900 °C, preferably about 1825 °C. The soak time is about 10-30 minutes, preferably about 15 minutes". The semi-continuous process can shorten the time needed to synthesize multiple batches of ALON, for example, by reducing the time needed to ramp the furnace to a soak temperature, the time needed for the furnace to cool, and the time needed to re-load the retort and to remove the formed ALON from the retort. The semi-continuous process also provides convenient handling of reactants and products.

Referring now to the claims, claim 1 points out that the method includes providing a chamber having a temperature therein greater than or equal to 1700°C; introducing aluminum oxide particles into the provided chamber; dispersing the particles within the provided chamber; and forming the aluminum oxynitride comprising passing nitrogen gas over the dispersed particles. Such method is not described or suggested in Maquire or Serpek taken either singly or in combination. As pointed out above, APPLICANT HAS DISCOVERED THAT BY PROVIDING A CHAMBER HAVING A TEMPERATURE GREATER THAN OR EQUAL TO 1700 °C AND HAVING A MIXTURE AGITATED IN THE CHAMBER A **SINGLE HEAT TREATMENT STEP** CAN PRODUCE ALON. In accordance with one embodiment of Applicant's invention, the ALON powder is produced in a single heat treatment step using a continuous process. Rather than use a two step process, Applicant describes a single step process.

Claim 6 points out that the method includes introducing a mixture comprising aluminum oxide and carbon into a chamber; heating the chamber comprising ramping the temperature of the chamber to a temperature greater than or equal to 1700°C; agitating the mixture within the heated chamber to make aluminum oxynitride. Such method is not described or suggested in Maquire or Serpek taken either singly or in combination.

Claim 11 points out that the method includes providing a chamber having a temperature therein greater than or equal to 1700°C; introducing a first reaction mixture comprising aluminum oxide and carbon into the provided chamber; agitating the first reaction mixture within the provided chamber to form aluminum oxynitride from the first reaction mixture; removing the aluminum oxynitride while maintaining the temperature of the chamber; and introducing a second reaction mixture comprising aluminum oxide and carbon into the chamber while

maintaining the temperature of the chamber. As pointed out above, APPLICANT HAS DISCOVERED THAT BY PROVIDING A CHAMBER HAVING A TEMPERATURE GREATER THAN OR EQUAL TO 1700 °C AND HAVING MIXTURE COMPRISING ALUMINUM OXIDE AND CARBON THE MIXTURE AGITATED IN THE CHAMBER A SINGLE HEAT TREATMENT STEP CAN PRODUCE ALON. Such method is not described or suggested in Maquire or Serpek taken either singly or in combination.

Claim 25 points out that the method includes providing a chamber having a temperature therein greater than of equal 1700°C; continuously introducing a reaction mixture comprising aluminum oxide and carbon into the provided chamber; agitating the reaction mixture within the provided chamber; and continuously providing the aluminum oxynitride. As pointed out above, APPLICANT HAS DISCOVERED THAT BY PROVIDING A CHAMBER HAVING A TEMPERATURE GREATER THAN OR EQUAL TO 1700 °C AND HAVING MIXTURE COMPRISING ALUMINUM OXIDE AND CARBON THE MIXTURE AGITATED IN THE CHAMBER A SINGLE HEAT TREATMENT STEP CAN PRODUCE ALON. Such method is not described or suggested in Maquire or Serpek taken either singly or in combination.

In view of the foregoing, since independent claims 6 and 25 are patentable over Maquire or Serpek taken either singly or in combination it is respectfully submitted that claims 12 and 28 are patentable over Maquire or Serpek taken either singly or in combination with JP 403023269A.

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Trademark Office Deposit Account No. 50-0845.

Respectfully submitted,

Date

1/16/03



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